

5p

[REDACTED]

[REDACTED]

Subject: Second Semi-annual Status Report, Research Grant NsG-271-62

Submitted to: Code SC, National Aeronautics and Space Administration, Washington 25, D.C.

Grant Title: Physiological <sup>E</sup>ffects of Weightlessness and Space Radiation on Hibernators

Investigator: X. J. Musacchia, Ph.D.

Institution: St. Louis University

Date: June 6, 1963

GPO PRICE \$ \_\_\_\_\_

OTS PRICE(S) \$ \_\_\_\_\_

Hard copy (HC) 1.00

Microfiche (MF) .50

1

N65 17058  
 (ACCESSION NUMBER)  
 5  
 (PAGES)  
 CR 50546  
 (NASA CR OR TMX OR AD NUMBER)

(THRU) \_\_\_\_\_  
 (CODE) \_\_\_\_\_  
 04  
 (CATEGORY)

[REDACTED]

CR-50,546

During the second Semi-annual period three experimental objectives have been underway. These are continuations of projects cited in the first Semi-annual Status Report (December 15, 1962) and new areas of research.

- A. Both ground squirrels and hamsters are being used in experiments with high levels of radiation (2000r using a Cobalt-60 source). Since relatively few experiments (circa 18 to 20 ground squirrels and 18 hamsters) have been conducted, it is too early to make comparisons with the earlier work dealing with X-radiation (2000r).

The Cobalt 60 exposure facility, belonging to the Department of Internal Medicine of the St. Louis University School of Medicine, has been used for this experiment. The facility consists of a plain source 9" X 6" with total activity in excess of 1,200 curies housed in a lead shielding tower. Variation of the source to target distance by raising or lowering the source in the tower, provides dose rates ranging from approximately 1,000r to 10,000r per hour. The lower dose rate with the source fully retracted has been used for these experiments. Field uniformity for this configuration is good. Measurements over the entire exposure chamber in a plane perpendicular to the incident beam 10" X 18", utilizing silver-activated metaphosphate glass dosimeters, shows a variation of -7% at the extremes of the chamber referred to the mid-point dose.

B. Autoradiographic and other cytochemical techniques are now being employed in studies of regeneration of intestinal epithelium. The first such study was with cold-torpid and non-torpid turtles, Chrysemys picta. In this investigation a graduate student made significant contribution. The more pertinent results were as follows:

1. In the turtle intestinal epithelium, mitotic activity is localized in the basal layer of cells and is less frequent in the apical 1/3 of each villus.
2. Duration of mitosis is estimated at 2 hours in the turtles maintained at 20° to 24°C.
3. A complete renewal of cell population of the intestinal epithelium is calculated to take about 8 weeks.
4. Mitotic activity in cold torpid turtles is suppressed and its reactivation on warming the animals is retarded.

This work is a major "first step" in seeking to use poikilothermous animals in radiation studies which may be applicable to space biology projects. The results of these experiments are being prepared for publication.

C. A third area of investigation pertained to an analysis of tissue catecholamine in x-irradiated and non-irradiated hibernating and non-hibernating animals. The role of catecholamine influence on radiation effects and intestinal absorption is an objective related to this project. The initial results of this work were as follows:

1. Hibernating ground squirrel, Citellus tridecemlineatus,

subjected to lethal doses of x-irradiation (2000r)  
demonstrate decreased concentrations of catecholamines  
in the liver and kidneys 20 hours following exposure.

2. Myocardial catecholamines do not appear to be altered  
if changes due to tissue hydration are accounted for.
3. There is reason to believe that some changes may be  
associated with arousal induced by the exposure;  
rather than with direct effects of the radiation.

A manuscript dealing with this work has been submitted and  
accepted for publication in the journal *Experientia*. Reprints will  
be forwarded and currently 25 true copies of the manuscript have  
been sent.

Projects currently underway and planned during the next 6 months include.

1. A study of the effects of 500r and 1000r exposures on intestinal absorption and tissue catecholamine levels in ground squirrels.
2. A study of the effects of radiation on cardiac, spleen, liver and intestinal catecholamines as related to prolonged cold exposure in hamsters is also underway.
3. Because of the high probability rhythmic cycle of cellular regeneration, hamster mucosal epithelium will be studied using tritiated thymidine. Currently this is a pilot project.
4. In another series of experiments an attempt is being made to depress catecholamine by treating hamsters with reserpine. Pilot experiments showed marked differences in "recovery" of spleen but not heart and kidney. This area of study will be expanded.